UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER
DASTOURI, MEHRDAD

ART UNIT	PAPER NUMBER
2623	

DATE MAILED: 07/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>01 June 2004</u>.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4 and 6-11* is/are pending in the application.

   4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4 and 6-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

   Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

   Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   a)☐ All b)☐ Some * c)☐ None of:

   1.☐ Certified copies of the priority documents have been received.

   2.☐ Certified copies of the priority documents have been received in Application No. _____.

   3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

   * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
   Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
   Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1.   A request for continued examination under 37 CFR 1.114, including the

fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection.

Since this application is eligible for continued examination under 37 CFR 1.114,

and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the

previous Office action has been withdrawn pursuant to 37 CFR 1.114.

Applicant's submission filed on June 1, 2004 has been entered.

Response to Amendment

2.   Applicants' amendment filed April 17, 2004, has been entered and made

of record.

3.   Applicants' arguments have been fully considered but they are not

persuasive. It is respectfully submitted that Applicants' remarks (Pages 6-10) are

explicit misinterpretation of Patent Laws.

Applicants argue in essence (Page 6-7, Subtitle 1.) that prior arts of record

(Aubin and Andre) do not disclose **the new limitation recited in the amended**

Claim 1 regarding "drawing an axial line (FAL, LAL) coinciding with a virtual axial

line in a respective one of the first and second digital views, wherein drawing

includes using a control means of a drawing program, and wherein each axial

line (FAL, LAL) corresponds to a piece-wise linear curve drawn from a start point

to an end point".

The Examiner disagrees and indicates that Andre clearly disclose this limitation (Abstract; Figures 1, 2 and 4; Pages 186-187; Sections 1.2 and 2), as thoroughly explained in the following:

Andre disclose drawing an axial line (FAL, LAL) coinciding with a virtual axial line in a respective one of the first and second digital views (Figures 1 and 4), wherein drawing includes using a control means of a drawing program (Abstract, Lines 7-12), and wherein each axial line (FAL, LAL) corresponds to a piece-wise linear curve drawn from a start point to an end point (Pages 186-187, in particular Page 186, Column 1, first paragraph and Section 1.2, Mathematical description of dual Kriging; Figure 1b, piece-wise linear curves $T_1 - T_2$, $T_2 - T_3$, etc.). Andre's teachings are based on a general framework for interpolation problems based on dual Kriging algorithm, which incorporates in a single formulation several methods such as **piecewise linear interpolation**, splines and least square function as a limit case.).

In response to Applicants arguments, Pages 8-9, Subtitle **3.**, it should be noted that Aubin discloses geometric models using 6 and 21 landmarks (Figures 3 and 2, respectively), and concludes that utilization of more landmarks allows greater accuracy but is a more 'expensive' method (Page 617, Conclusion; Page 616, Column 2, last Paragraph). Consequently, utilization of 21 landmarks in lieu of 6 landmarks will result in the standard optimization decision-making problem of evaluating accuracy against cost. Utilization of 21 landmarks is an enhancement of systems using 6 landmarks to obtain more accurate results by using a more expensive system. Using more landmarks is an improvement to

the existing systems that utilizes fewer landmarks, and **will not destroy** the

intended function of a three-dimensional reconstruction system of human spine.

Based on the above discussion, in response to Applicants arguments,

Pages 8-9, Subtitle **2.**, it should be noted that prior arts' teachings regarding

utilization of 6 or 21 landmarks, in lieu of claimed invention that requires 4

landmarks (2 per each view), is not **teaching away** from the claimed invention

because prior arts are in the same field of applicant's endeavor, and reasonably

pertinent to the particular problem with which the applicant was concerned.

Regarding Applicants' argument (Pages 8-9, Subtitle **4.**), it is submitted

that claimed invention does not recite a limitation concerning providing three-

dimensional geometric modeling of the spine from a biplanar image

reconstruction **in an inexpensive and quick manner for usage by any**

radiologist.

Regarding Applicants' argument (Pages 9-10, Subtitle **5.**) concerning the

improper combination of references, it is submitted that Aubin's teachings are in

the same field of endeavor for three-dimensional reconstructions of the human

spine (analogous art to Andre's invention and the instant claimed invention)

utilizing the same methodology as Andre (dual Kriging; Page 613, Column 2,

Section 2.4).

Furthermore, Andre and Aubin inventions are both established on the

same criterion, wherein Aubin further enhances Andre's invention by utilizing

more landmarks that is the best evidence for appropriateness of their

combination. In addition, incorporation of the expertise of the common Author "J.

Dansereau" in both inventions is another proof for analogousness and

combinability of these references. It is further submitted that contrary to

Applicants' arguments, Andre explicitly teaches the limitation, "drawing an

axial.....", as thoroughly discussed above in response to arguments Page 6-7,

Subtitle **1**.

Claim Rejections - 35 USC § 103

4.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for

all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described
> as set forth in section 102 of this title, if the differences between the subject matter sought to
> be patented and the prior art are such that the subject matter as a whole would have been
> obvious at the time the invention was made to a person having ordinary skill in the art to which
> said subject matter pertains. Patentability shall not be negatived by the manner in which the
> invention was made.

5.   Claims 1-4, 6 and 7 are rejected under 35 U.S.C. 103(a) as being

unpatentable over André et al. (hereinafter André), "Approach for the smoothing

of three-dimensional reconstructions of the human spine using dual Kriging

interpolation" in view of Aubin et al. (hereinafter Aubin), "Morphometric

evaluations of personalized 3D reconstructions and geometric models of the

human spine".

Regarding Claim 1, Andre discloses an image processing method for

providing three-dimensional geometric modeling of the spine, using a biplanar

image reconstruction, comprising:

acquiring a first digital view of part of the spine (Figure 1, Frontal, 0° PA

(postero-anterior));

acquiring a second digital view of the same part of the spine taken from a different angle around the longitudinal axis of the spine (Figure 1, Lateral, 20° angled down PA);

drawing an axial line (FAL, LAL) coinciding with a virtual axial line in a respective one of the first and second digital views (Figures 1 and 4), wherein drawing includes using a control means of a drawing program (Abstract, Lines 7-12), and wherein each axial line (FAL, LAL) corresponds to a piece-wise linear curve drawn from a start point to an end point (Pages 186-187, in particular Section 1.2, Mathematical description of dual Kriging; Figure 1b, piece-wise linear curves $T_1 - T_2$, $T_2 - T_3$, etc.). Andre's teachings are based on a general framework for interpolation problems based on dual Kriging algorithm, which incorporates in a single formulation several methods such as **piecewise linear interpolation**, splines and least square function as a limit case.);

matching the dimensions of the digital views (F, L) from two predetermined corresponding landmarks on each view (Figure 1, six vertebral landmarks; Figures 4-6; Pages 188-190, Section 3);

performing a spline calculation (A function defined on an interval using to approximate a given function, and is composed of pieces of simple functions defined on subintervals and joined at their endpoints with a suitable degree of smoothness; Dual Kriging smoothing interpolation method) to provide a smoothed axial line (FAC, LAC) on each digital view (Abstract; Section 4; Figures 4-6, esp. Figures 5a-5d; Section 3.2 and 4), the spline calculation including mathematical modeling of the drawn piece-wise linear curves of the first and

second digital views (Page 186, first Paragraph; and Section 1.2), for supplying

respective new digital smoothed curves (Figures 4-6), the new digital smoothed

curves being constructed with interpolated values provided between points of the

respective piece-wise linear curves (Figures 2-6; Pages 187-188; Section 2);

deriving three-dimensional coordinates (z, x, y) of corresponding points

along the spine as a function of the smoothed axial lines (FAC, LAC) (Figures 4-

6; Sections 2-4).

Andre does not explicitly disclose wherein matching includes estimate a

scale factor and translation factor to make a system of coordinates for each view

coincide, to provide a unique system of coordinates for the first and second

digital views.

Aubin, in the same field of endeavor of for three-dimensional

reconstructions of the human spine teaches:

wherein matching includes estimate a scale factor and translation factor to

make a system of coordinates for each view coincide, to provide a unique system

of coordinates for the first and second digital views (Page 613, Column 1.

Transforming the coordinates of the reconstructed landmarks into the reference

coordinate system.)

It would have been obvious to one of ordinary skill in the art at the time the

invention was made to modify Andre's invention according to the teachings of

Aubin to estimate a scale factor and translation factor to make a system of

coordinates for each view coincide, to provide a unique system of coordinates for

the first and second digital views because it is a conventional methodology

routinely implemented in image processing for minimizing spatial differences

between the reconstructed landmarks and the corresponding measured

landmarks on the specimen (Aubin, Page 613, Column 1).

As per Claim 2, André teaches:

wherein, for matching the two views, an axial line is drawn (Figures 4-6,

and then iteratively, curve fitted to the landmarks points) and the two landmarks

(marked TI-T12 or LI-L5) are set on said axial line on each view (Figures 4-6).

As per Claim 3, Aubin teaches:

wherein matching of the dimensions of the two views is performed by a

calculating matching coordinates for the two corresponding landmarks (Page

613, Column 1, 2nd Paragraph beginning, "The coordinates...").

As per claim 4, Aubin teaches:

wherein a common system of coordinates is determined for the two views

from the matched coordinates of the two corresponding landmarks (Page. 613,

Column 1, Paragraph 3).

As per Claim 6, André teaches:

wherein three dimensional coordinates of corresponding points along the

spine are determined for points regularly spaced along the axis of coordinates

corresponding to the longitudinal axis of the spine (Figures 4-6, Points on Lateral

(Z-Y) and coronal (X-Z).

As per Claim 7, André teaches:

wherein the common system of coordinates is an orthogonal system, the

first view is a frontal view, the second view is a lateral view orthogonal to the

frontal view, with a common axis in the direction of the longitudinal axis of the spine, a second axis parallel to the frontal plane of view and the third axis parallel to the lateral plane of view (Figure 4, Frontal, Lateral and Coronal views, Z, X and Y axes).

6.   Claims 8-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over André et al., (hereinafter André), "Approach for the smoothing of three-dimensional reconstructions of the human spine using dual Kriging interpolation" further in view of Aubin et at. (hereinafter Aubin), "Morphometric evaluations of personalized 3D reconstructions and geometric models of the human spine" and Steiger et al. (U.S. 5,483,960), hereinafter Steiger.

As per Claim 8, André teaches:

the computer program for allowing efficient use of dual Kriging smoothing interpolation according to the methodology recited in Claim 1 (Abstract and Sections 2-4).   The computer program disclosed by André will be inherently included in a computer system. Although the display means recited in the claim is not explicitly disclosed by Aubin or André, the computer systems conventionally include display means for displaying the result of executed programs as disclosed by Steiger (Figures 12 and 15, also displayed images of different vies of spine as depicted in Figures 1A, 1B, 3A, 3B, etc.).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify André and Aubin's combination according to the teachings of Steiger to display different spine views because it is a conventional procedure routinely implemented in the art.

Regarding Claims 10 and 11, arguments analogous to those presented for Claims 8 and 9 are applicable to Claims 10 and 11.

Contact Information

7.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mehrdad Dastouri whose telephone number is (703) 305-2438. The examiner can normally be reached on Monday to Friday from 8:00 a.m. to 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703) 308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MEHRDAD DASTOURI
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Art Unit 2623
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